

(e) *Calibration of equipment for point-source testing of running losses.* For the point-source method, the running loss fuel vapor sampling system shall be calibrated as a CVS system, as specified in § 86.119, with the additional specification that the vapor sampling system verification be conducted as follows:

(1) The following “gravimetric” technique can be used to verify that the vapor sampling system and analytical instruments can accurately measure a mass of gas that has been injected into the system. If the vapor sampling system will be used only in the testing of petroleum-fueled engines, system verification may be performed using propane. If the vapor sampling system will be used with methanol-fueled vehicles as well as petroleum-fueled vehicles, the system verification performance check must include a methanol check in addition to the propane check. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(i) Obtain a small cylinder that has been charged with pure propane gas. Obtain another small cylinder that has been charged with pure methanol if the system will be used for methanol-fueled vehicle testing. Since this cylinder will be heated to 150–155 °F, care must be taken to ensure that the liquid volume of methanol placed in the cylinder does not exceed approximately one-half of the total volume of the cylinder.

(ii) Determine a reference cylinder weight to the nearest 0.01 grams.

(iii) Operate the vapor sampling system in the normal manner and release a known quantity of pure propane into the most frequently used fuel vapor collector during the sampling period (approximately 5 minutes).

(iv) Continue to operate the vapor sampling system in the normal manner and release a known quantity of pure methanol into the system during the sampling period (approximately 5 minutes).

(v) The calculations of § 86.1244 are performed in the normal way, except in the case of propane. The density of propane (17.30 g/ft<sup>3</sup>/carbon atom (0.6109 kg/m<sup>3</sup>/carbon atom)) is used in place of the density of exhaust hydrocarbons. In

the case of methanol, the density of 37.71 g/ft<sup>3</sup> (1.332 kg/m<sup>3</sup>) is used.

(vi) The gravimetric mass is subtracted from the vapor sampling system measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(vii) The cause for any discrepancy greater than ±2 percent must be found and corrected.

(2) This procedure shall be conducted in the point-source running loss test environment with the collector installed in a vehicle in the normal test configuration. The fuel of the test vehicle shall either be diesel, or it shall be kept under 100 °F (38 °C). Two to six grams of pure propane and two to six grams of pure methanol shall be injected into the collector while the vehicle is operated over one Heavy-Duty Vehicle Urban Dynamometer Driving Schedule, as described in § 86.1215 and appendix I of this part. The propane and methanol injections shall be conducted at the ambient temperature of 95±5 °F (35±3 °C).

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#### § 86.1218-85 Dynamometer calibration.

(a) The dynamometer shall be calibrated at least once each month or performance verified at least once each week and then calibrated as required. The calibration shall consist of the manufacturer's recommended calibration procedure plus a determination of the dynamometer frictional power absorption. If the dynamometer is to be used for driving only the reference (transient) schedule, the frictional power absorption needs to be determined only at 50.0 mph (80.5 km/hr). If the dynamometer is to be used for driving the steady-state cycle, the frictional power absorption needs to be determined through the range of 15 to 50 mph. One method for determining dynamometer frictional power absorption at 50.0 mph (80.5 km/hr) is described below. The same general method can be used at other speeds. Other methods may be used if shown to yield equivalent results. The measured absorbed road power includes the dynamometer friction as well as the power absorbed

by the power absorption unit. The dynamometer is driven above the test speed range. The device used to drive the dynamometer is then disengaged from the dynamometer and the roll(s) is (are) allowed to coastdown. The kinetic energy of the system is dissipated by the dynamometer. This method neglects the variations in roll bearing friction due to the drive axle weight of the vehicle. In the case of dynamometers with paired rolls, the inertia and power absorption of the free (rear) roll may be neglected if its inertia is less than 3.0 percent of the total equivalent inertia required for vehicle testing.

(1) Devise a method to determine the speed of the roll(s) to be measured for power absorption. A fifth wheel, revolution pickup, or other suitable means may be used.

(2) Place a vehicle on the dynamometer or devise another method of driving the dynamometer.

(3) If the dynamometer is capable of simulating more than a single inertia mass, engage the inertial flywheel or other inertial simulation system for the most common vehicle mass category for which the dynamometer is used. In addition, other vehicle mass categories may be calibrated, if desired.

(4) Drive the dynamometer up to 50 mph (80.5 km/hr).

(5) Record indicated road power.

(6) Drive the dynamometer up to 60 mph (96.9 km/hr).

(7) Disengage the device used to drive the dynamometer.

(8) Record the time for the dynamometer roll(s) to coastdown from 55.0 mph (88.5 km/hr) to 45.0 mph (72.4 km/hr).

(9) Adjust the power absorption unit to a different level.

(10) Repeat steps (4) to (8) above sufficient times to cover the range of road power used.

(11) Calculate absorbed road power ( $HP_d$ ). (See paragraph (c) of this section.)

(12) Plot indicated road load power at 50 mph (80.5 km/hr) versus road load power at 50 mph (80.5 km/hr).

(b) The performance check consists of conducting a dynamometer coastdown and comparing the coastdown time to that recorded dur-

ing the last calibration. If the coastdown times differ by more than 1 second or by 5 percent of the time recorded during the last calibration, whichever is greater, a new calibration is required.

(c) Calculations. The road load power actually absorbed by each roll assembly (or roll-inertia weight assembly) of the dynamometer is calculated from the following equation:

$$HP_d = (1/2) (W/32.2) (V_1^2 - V_2^2) / 550t$$

Where:

$HP_d$  = Power, horsepower (kilowatts)

W = Equivalent inertia, lb (kg)

$V_1$  = Initial velocity, ft/s (m/s) (55 mph = 88.5 km/h = 80.67 ft/s = 24.58 m/s)

$V_2$  = Final velocity, ft/s (m/s) (45 mph = 72.4 km/h = 66 ft/s = 20.11 m/s)

t = Elapsed time for rolls to coast from 55 mph to 45 mph (88.5 to 72.4 km/hr).

(Expressions in parenthesis are for SI units). When the coastdown is from 55 to 45 mph (88.5 to 72.4 km/hr) the above equation reduces to:

$$HP_d = 0.06073 (W/t)$$

For SI units:

$$HP_d = 0.09984 (W/t)$$

The total road load power actually absorbed by the dynamometer is the sum of the absorbed road load power of each roll assembly.

#### § 86.1221-90 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibrations.

(a) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. (The HFID used with methanol-fueled vehicles shall be operated at  $235^\circ \pm 15^\circ \text{F}$  ( $113^\circ \pm 8^\circ \text{C}$ )). Analyzers used with gasoline-fuel and liquefied petroleum gas-fuel shall be optimized using propane. Analyzers used with natural gas-fuel may be optimized using methane, or if calibrated using propane the FID response to methane shall be determined and applied to the FID hydrocarbon reading. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.